

Application No. 10/588,743  
Paper Dated: February 5, 2009  
In Reply to USPTO Correspondence of October 8, 2008  
Attorney Docket No. 5292-062352

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. : 10/588,743 Confirmation No. 9665  
Applicant : CONG XIAO  
Filed : August 7, 2006  
Title : MULTIPLE DIFFERENTIAL VOLUME TUBE  
MEASUREMENT QUANTITATIVE CONVEYING  
DEVICE AND ITS CONVEYING METHOD  
THEREOF  
Group Art Unit : 2855  
Examiner : Andre J. Allen  
Customer No. : 28289

Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

AMENDMENT

Sir:

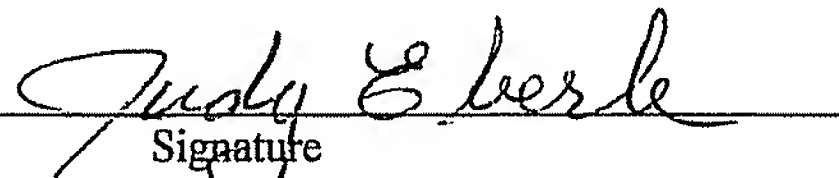
In response to the Office Action dated October 8, 2008, Applicant submits the following amendments and remarks, along with a petition for a one month extension of time.

**Amendments to the Claims** are reflected in the listing of claims which begins on page 2 of this paper.

**Remarks** begin on page 4 of this paper.

I hereby certify that this correspondence is being electronically submitted to the United States Patent and Trademark Office on the date below.

February 5, 2009  
Date

  
Signature

Judy Eberle

Typed Name of Person Signing Certificate

**AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions, and listings, of claims in the application.

**Listing of Claims**

1-6. (Canceled).

7. (Currently Amended) A multiple differential volume tube measurement quantitative conveying device which includes volume tubes, inlet pipes and outlet pipes, wherein,  
there are at least two pieces of the volume tubes, divided into at least two groups;  
the inlet pipe of each group volume tube is connected with a main inlet pipe;  
the outlet pipe of each group volume tube is connected with a main outlet pipe;  
a drive mechanism is set for separately driving each volume tube group; and  
the drive mechanism is simultaneously connected with a controller which controls the drive mechanism to drive the volume tubes to convey fluid operated in complementary manner.

8. (Previously Presented) The conveying device of claim 7, wherein the controller is a computer operated in differential manner.

9. (Previously Presented) The conveying device of claim 8, including four pieces of volume tubes, divided into two groups, wherein two pieces of volume tubes in each group are connected in series, and the two groups are connected in parallel.

10. (Previously Presented) The conveying device of claim 8, including four pieces of volume tubes which are connected in parallel at each fluid inlet and outlet, respectively.

11. (Previously Presented) A conveying method with a multiple differential volume tube measurement quantity conveying device, in which multiple pieces of volume tubes are connected in groups, and a chief control computer is set for controlling the drive capability/delivery capacity, said method including the steps of:

A) confirming the conveying state of any referenced tube group; and

B) determining the compensatory conveying volume and the conveying state of the other volume tube groups according to a difference between the predetermined conveying volume and the conveying volume of the referenced volume tube groups.

12. (Previously Presented) The conveying method of claim 11, wherein the conveying state includes uniform speed, uniform acceleration or uniform deceleration.

### REMARKS

Claims 7-12 are pending. Applicant thanks the Examiner for allowing claims 11 and 12. Presently, claim 7 stands rejected under 35 U.S.C. §112, second paragraph, for indefiniteness. Claims 7-10 stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,747,307 to Humberstone et al. (hereinafter, "Humberstone"). Claims 8-10 stand rejected under 35 U.S.C. §103 as being obvious over Humberstone in view of U.S. Patent No. 5,669,839 to Graf et al. (hereinafter "Graf").

#### Prior Art Rejections

The Examiner has taken the position that Humberstone teaches each and every element of claims 7-10, thereby anticipating them. The Examiner has also taken the position that claims 8-10 are rendered obvious by Humberstone in combination with Graf. In view of the foregoing amendments and the following remarks, Applicant respectfully traverses these rejections.

Humberstone discloses a device for controlling the flow of a fluid through two piston chambers (16, 18) in a coordinated manner to produce a constant flow. *See* Humberstone col. 1, lines 51-59; FIGS. 1-2. The device in Humberstone includes four valves (A, B, C, D) that open and close to allow the piston chambers (16, 18) to be filled, emptied, and refilled. *Id.* col. 2, lines 43-68. It is the coordinated operation of these valves that allows the constant flow to be obtained. *See Id.* col. 1, lines 51-59, FIG. 6 ("Once the chamber feeding into the outlet is empty, then the valves are switched over so that the other chamber, which is now full, feeds into the outlet while the first chamber is refilled from the inlet. In practice, to ensure a continuous regular flow, the opening and closing of the valves preferably overlap.").

Independent claim 7 is directed to a multiple differential volume tube measurement quantitative conveying device which includes volume tubes, inlet pipes and outlet pipes. Claim 7 further recites that the device includes at least two pieces of the volume tubes, divided into at least two groups, and that the inlet pipe of each group volume tube is connected with a main inlet pipe, the outlet pipe of each group volume tube is connected with a main outlet pipe, and a drive mechanism is set for separately driving each volume tube group. Claim 7 is currently amended to further recite that "the drive mechanism is simultaneously connected with a controller which controls the drive mechanism to drive the

volume tubes to convey fluid in complementary manner.” Support for this amendment may be found, for example, in paragraphs 10, 13, and 16-18, and in Figs. 2 and 3.

Contrary to the Examiner’s position, the valves (A, B, C, D) in Humberstone are not equivalent to the drive mechanisms of the present invention as set forth in currently amended independent claim 7. The drive mechanisms (5) of the present invention are used to drive the volume tubes (6) as directed by the controller to control the manner by which fluid flows through the pipes. *See* ¶ 10 (“A drive mechanism 5 is set for separately driving each volume tube group. The mentioned drive mechanism 5 is simultaneously connected with a controller in complementary manner.”). This structure and operation of the present invention is set forth in currently amended claim 7. By contrast, the valves (A, B, C, D,) in Humberstone are used to control the manner in which fluid flows through the fluid lines (12, 14, 20, 22). Although Humberstone includes pistons (24, 26) which are similar to the drive mechanisms (5) of the present invention, it is not the pistons in Humberstone which are controlled by a controller to direct the flow through the lines. Rather, it is clearly the valves (A, B, C, D). *See* Humberstone, col. 1, lines 51-59; FIG. 6. Essentially, Humberstone controls the flow of fluid via opening and closing valves within the lines, while the present invention controls the flow of fluid via driving the volume tubes.

The present invention requires no such valves integrated into the pipes to control the resulting flow through the outlet pipe (4). Therefore, the present invention as set forth in currently amended claim 7 is fundamentally different from that disclosed in Humberstone. “To anticipate a claim, the reference must teach each element of the claim.” MPEP §2131. Here, Humberstone does not disclose “a drive mechanism [which] is simultaneously connected with a controller which controls the drive mechanism to drive the volume tubes to convey fluid in complementary manner.” Further, nothing in Humberstone teaches or suggests how one would go about removing the valves (A, B, C, D) in Humberstone and instead directly driving the volume tubes to make the present invention as set forth in currently amended claim 7. The teachings of Graf do not cure this deficiency of teachings in Humberstone. While Graf does teach that a computer, as set forth in claim 8, may be used as a controller, Graf contains no teaching or suggestion as to how one would adapt the device in Humberstone to create the device set forth in currently amended claim 7. For at least these reasons, the subject matter of claim 7 cannot be said to have been “as a whole” obvious to a person having ordinary skill in the art. MPEP §2142.

In view of the foregoing, currently amended independent claim 7 is believed to be patentable over the prior art of record. Because claims 8-10 depend from and further limit currently amended claim 7, claims 8-10 are likewise patentable over the prior art.

#### §112 Rejection

The Examiner has taken the position that claim 7 is indefinite because the term “complementary manner” is not clearly defined. Applicant respectfully traverses this rejection.

The term “complementary manner” as used in claim 7 is sufficiently clear. The specification explains that the driving and conveyance of the fluid by the controller is done in a complementary manner. *See* ¶¶ 13, 16-18. “Complementary manner” is therefore defined and would be understood by those of ordinary skill in the art as it is used in the specification, namely to indicate the relationship between the relative operational driving phases of the volume tubes and the total constant flow of fluid through the outlet pipe. For example, with regard to a device having two volume tubes, the specification states that “[a] measurement delivery pump device of double piston volume tubes uses a paralleling complementary operation method whose operational phase difference is 180 degree[s],” and goes on to elaborate on the details of the complementary driving of the volume tubes. *See* ¶¶ 16-18. Figs. 2 and 3 illustrate this example of complementary operation described in the specification.

This disclosure sufficiently satisfies the requirements of 35 U.S.C. §112, second paragraph. “The test for definiteness under 35 U.S.C. §112, second paragraph, is whether ‘those skilled in the art would understand what is claimed when the claim is read in light of the specification.’” MPEP §2173.02; *see also* MPEP §2173.01 (Patent applicants may “define in the claims what they regard as their invention essentially in whatever terms they choose so long as any special meaning assigned to a term is clearly set forth in the specification.”). Because the term “complementary manner” is sufficiently well-defined within the specification and figures, Applicant respectfully requests that the §112 rejection to claim 7 be withdrawn.

While Applicant believes that no amendment to claim 7 is necessary in this instance to satisfy 35 U.S.C. § 112, second paragraph, the amendments currently made to claim 7 add further contextual clarification for the term “complementary manner.” Claim 7 is

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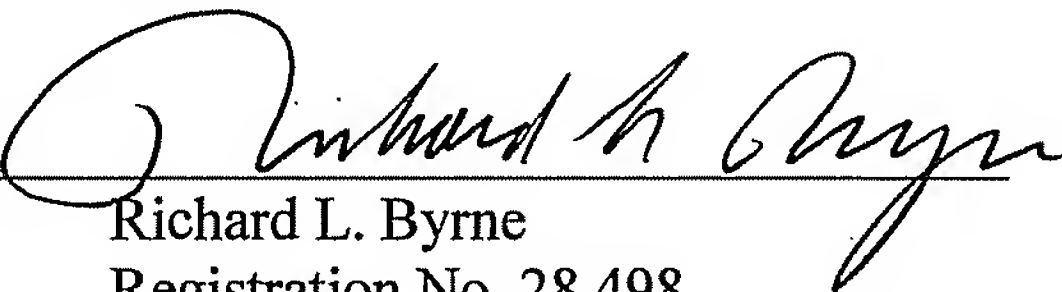
currently amended to recite that "the drive mechanism is simultaneously connected with a controller which controls the drive mechanism to drive the volume tubes to convey fluid operated in complementary manner." This added language reflects the description of the present invention contained in the specification, as discussed above, and therefore further clarifies the meaning of "complementary manner."

Withdrawal of the rejection under 35 U.S.C. §112 is requested.

#### CONCLUSION

For the foregoing reasons, Applicant respectfully requests that the rejections be withdrawn, and that claims 7-10, along with claims 11-12, be allowed.

Respectfully submitted,  
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